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Readiness thru Health

TAB D

GUIDELINES FOR THE USE OF CDC LIGHT TRAPS

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With the addition of carbon dioxide (CO_2) as an attractant in the form of dry ice, the CDC trap becomes a powerful surveillance tool. The CO_2 baited CDC trap samples a wider range of mosquito species and significantly increases the numbers of mosquitoes captured compared to a trap that utilizes light as the sole attractant. Since the specimens are captured alive, virus assays are possible.

Introduction: The New Jersey Light Trap provided the mosquito control community with a mechanical device capable of sampling host seeking mosquitoes. The trap was designed with the hope of maximizing adult surveillance results and minimizing human labor and bias. At present, this trap remains a useful tool in mosquito surveillance but its design places certain restrictions on its use. Conventional usage requires electric current to power a trap that is expected to remain at a location for long periods of time. As a result, the trap proved to be inefficient as a short-term monitor of mosquito populations, particularly in areas where electric current is inaccessible.

Soon after the creation of the New Jersey Light Trap the search was on for a trap that would more adequately fulfill the needs of those concerned with arbovirus surveillance. In short, a trap that was portable, capable of the collection of live specimens, and not dependent on a fixed electrical source as a source of power was needed. Over the years, a variety of trap types concerned with portability and live capture of specimens have been designed. In 1962, the CDC miniature light trap (CDC = Centers for Disease Control) was introduced specifically for arbovirus surveillance and other short-term mosquito investigations.

The CDC trap mimicked the New Jersey Light Trap in the principle of attracting mosquitoes with white light and capturing them with the down draft produced by a motor

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*Adapted from James R. McNelly 1989. *The CDC Trap as a Special Monitoring Tool.* Proc 76th Meeting, NJ Mosq Contr Assoc: 26-33.

and fan. However, the CDC trap utilized lightweight components, a 6-volt battery and a live capture net. Weighing in at less than 2 pounds, the CDC trap was quickly adopted as the standard trap type in the collection of vector-borne virus (arbovirus) samples.

Equally important to a discussion of CDC traps is the research that was conducted with carbon dioxide as a mosquito attractant. It had been suggested that carbon dioxide was an attractant so further exploration of its potential in conjunction with a mechanical trap was conducted. This research created the perfect "marriage", combining carbon dioxide in the form of dry ice with the CDC Trap.

Discussion: The overall design of the CDC trap has remained intact since 1962, with only minor differences in the construction. Changes have been made to the wiring harness in relation to different types of battery utilization. The original traps were powered with 6-volt wet cell lead-acid batteries. Today the most common power source for the CDC trap are the sealed gel cell battery or disposable/ rechargeable D cell batteries (1,2). Battery selection should be based on the most practical design/use for the task at hand.

Other modifications are available to facilitate special needs in surveillance. If live specimens are not a requirement, a kill jar can be substituted for the live collection net. A photoswitch option that automatically turns the trap on and off is also available. An air-actuated gate system should always be used when the trap is operated by a photoswitch. The gate stays open to allow mosquito entrance as long as the trap is running but closes to prevent specimens from escaping when the trap stops running. The gate system is a desirable option whenever a live collection net is used since it offers a measure of safety against any type of trap failure. The air-actuated gate system may be purchased as a separate unit (1) and retrofitted to any of the existing CDC trap models.

The full potential of a CDC trap cannot be obtained without the addition of Co_2 as either dry ice or as a metered gas. The trap was designed to use an extremely small light bulb and the light output is much weaker than the 25-watt bulb in a New Jersey light trap. Mosquitoes can be collected with light as the only attractant but the addition of dry ice greatly enhances the trap's capabilities. An increase of 400-500% in overall catch when the trap is supplemented with dry ice has been reported. Dry ice also increases the number of species captured by 20-25%.

If the CDC trap is used with dry ice, removal of the light bulb will actually improve the collection by eliminating "trash insects", such as beetles and moths that fly readily to light. This eliminates the tedious sorting process that is a prerequisite for identification of most light trap collections. Without the light, the trap is also less noticeable, a consideration in areas where traps may be subject to theft.

The amount of dry ice, as well as the type of container used to hold it, will affect the amount of carbon dioxide released over time. In most instances, a five pound block of dry ice is sufficient to cover the normal dusk to dawn trapping period. This delivers between 400-500 ml of carbon dioxide per min., a rate that is comparable to the amount released

by a large mammal. Insulated containers are available from the manufacturer' but they are easily constructed. One such container is a denim drawstring bag that is large enough to hold 5 pounds of dry ice. The bag is sewn with two layers of denim separated by a layer of insulating material taken from a space blanket. A drawstring is then sewn into the top of the bag to allow the opening to be cinched. The bag is hung in a position to allow the carbon dioxide to release directly next to and slightly under the aluminum hood of the CDC trap. When host-seeking mosquitoes enter the stream of gas, they are drawn into the trap by the fan**.**

In regions where dry ice is difficult to obtain, there are other options. One would be the purchase of a dry ice maker; another requires construction of a cylinder delivery system. In both cases, economics should be considered in relation to the projected goals and long-term benefits from the surveillance data.

Applications: Personnel involved in the surveillance of adult mosquitoes are normally faced with answering one or more basic questions, typically WHAT SPECIES ARE PRESENT and/or HOW MANY? How best to resolve those questions is dependent upon many variables. These may include the amount of time available to the worker, under what field conditions the surveillance will take place, and what is the information gathered ultimately to be used for? A suitable trap is then selected to do the most efficient job. For the most part, a CDC trap is a surveillance tool that is used in special situations. Unlike the New Jersey light trap that remains stationary in a location for long periods of time, the CDC trap's portable design is intended for short-term use in a variety of locations. Circumstances usually have the surveillance specialist attempting to define an unknown mosquito population in terms of species and numbers. Additional information regarding the extent of an infestation, its disease potential and other particulars may also be desired. A common situation is a complaint of mosquito activity called in by a resident. Two or more CDC traps placed on the property would prove or disprove the validity of the complaint. Regardless of the actual catch, the homeowner is usually favorably impressed with the attention that's been paid to their complaint. One way of heading off potential problem areas is to survey those areas before people move into them.

General population checks may be required in the vicinity of proposed project sites, such as an area that is scheduled for an adulticide treatment or one that will undergo water management to determine the extent of the existing problem. In both instances, properly placed CDC traps will provide the necessary data and help direct control efforts. In the case of adulticiding, the success or failure of the control effort will be determined over a relatively short trapping period. In the latter case, surveillance at periodic intervals over the course of an entire mosquito season would help to develop and document a short-term history of adult mosquito activity for the area. The success of the project after management would be determined with post management trapping to document the degree of mosquito reduction after the work was completed.

The height at which the trap is suspended can influence the species composition of the collection. Normally, traps are hung 5-6 ft off the ground, the height at which the New

Jersey light trap operates. This height is satisfactory for the majority of species encountered in routine surveillance i.e. *Aedes* and *Culex sp*., but will not adequately sample species like *Culiseta melanura*, which seek hosts in the canopy layer. Likewise, mosquitoes that do not host-seek between dusk and dawn will either be missed or underrepresented. A dry ice baited CDC trap would be of limited value for *Aedes albopictus* surveillance if the trap were operated at night because *Ae. albopictus* is a daytime feeder. Daytime feeding adults (diurnal) can be trapped by simply adjusting the trap hours of operation to include a representative portion of daylight collection time. The amount of carbon dioxide that is released could affect the collection by excluding species that feed on hosts with lower respiration rates than the 4-5 pounds of dry ice exudes. Dry ice attracts several species of males, which showed a positive correlation with the overall mosquito density. However, some believe that carbon dioxide repels males of many mosquito species.

Guidelines for CDC Trapping: The following guidelines are offered to minimize variability in the use of CDC traps for mosquito surveillance:

1. Whenever possible, use the CDC trap with a dry ice supplement. A 4-5-pound block in an insulated container will mimic a large mammal's respiration and last long enough to cover the usual dusk to dawn trapping period.

2. Remove the light source when dry ice is used as an attractant; the absence of light will eliminate other photopositive insects from the collection and increase the efficiency of identification.

3. Hang the dry ice adjacent to, and slightly below, the aluminum lid of the CDC trap to draw mosquitoes as close as possible to the collection fan.

4. Whenever possible, use CDC traps with an air actuated gate system. The gate offers a measure of protection from trap failure, improperly charged batteries, late trap pick up, etc.

5. Trap at least one hour prior to dusk until one hour after dawn to insure that surveillance is conducted during the primary host-seeking periods for most species.

6. Hang the trap 5-6 ft from ground level unless specific information is needed on canopy dwellers. For most nuisance species, this height will provide a reliable indication of activity.

7. Try to set the traps along the edges of habitats to increase trapping efficiency. A trap located strictly in one ecosystem/ habitat may exclude certain species; trapping along the edge of a swamp, for example, will provide a picture of those species found not only in the swamp, but also in the nearby upland.

8. Consider two traps as the minimum number in most situations and compare your data to detect differences that may have been due to outside influences.

9. Be aware that differences do exist in the host seeking behavior of some species and that alterations from these general guidelines may be necessary to get complete surveillance data. Strictly daylight feeding species will not be accurately represented in dusk-dawn collections. A species that host seeks in tree canopies will not be accurately sampled by a trap that is suspended 5 ft from the ground. Whenever possible, become familiar with the host seeking habits of the mosquitoes being surveyed.

10. Label the traps “Do Not Touch.”

Conclusions: The control of adult mosquitoes begins with proper surveillance. For special surveillance of short duration, the dry ice baited CDC trap is an efficient, reliable surveillance tool for the surveillance specialist. This trap can be used to assess a homeowner’s complaint, check the success of an adulticide or gather virus information. The CDC trap’s portability, battery power, and efficiency add versatility to the surveillance program.